

BUSINESS ANALYTICS AND DATA MATURITY IN LOGISTICS SMES: A STRUCTURED QUALITATIVE COMPARISON BETWEEN AUSTRALIA AND VIETNAM

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Abstract:

This study develops and applies a seven-dimensional data maturity framework to compare logistics small and medium-sized enterprises (SMEs) in Australia and Vietnam through a structured qualitative synthesis. The evidence indicates that Australian logistics SMEs are generally proactive, with more mature and systematically managed practices concentrated among better-connected firms and networks, whereas Vietnamese SMEs typically range from reactive to early proactive stages. Substantial within-country variation is observed in both contexts. The study contributes a transparent evidence hierarchy and a logistics-SME-specific maturity framework, while highlighting differences in data foundations, process integration, business intelligence, predictive analytics, and ecosystem-level data use across the two countries.

Keywords: business analytics, data maturity, digital logistics, logistics SMEs, Australia, Vietnam

Phân tích kinh doanh và mức độ trưởng thành dữ liệu trong các doanh nghiệp logistics nhỏ và vừa: So sánh định tính có cấu trúc giữa Australia và Việt Nam

Tóm tắt:

Nghiên cứu này xây dựng và áp dụng khung đánh giá mức độ trưởng thành dữ liệu gồm bảy chiều nhằm so sánh các doanh nghiệp nhỏ và vừa (SMEs) trong lĩnh vực logistics tại Australia và Việt Nam thông qua phương pháp tổng hợp định tính có cấu trúc. Các bằng chứng hiện có cho thấy các SMEs logistics tại Australia chủ yếu ở trạng thái chủ động (proactive), trong đó các thực hành ở mức quản trị (managed) tập trung nhiều hơn ở những doanh nghiệp có khả năng kết nối tốt và tham gia vào các mạng lưới liên kết. Trong khi đó, các SMEs logistics tại Việt Nam nhìn chung nằm trong khoảng từ phản ứng (reactive) đến bước đầu chủ động (early proactive). Ở cả hai quốc gia, sự khác biệt giữa các doanh nghiệp trong cùng một quốc gia là đáng kể. Nghiên cứu đóng góp một hệ thống phân cấp bằng chứng minh bạch, một khung đánh giá mức độ trưởng thành được thiết kế riêng cho SMEs logistics và một lộ trình phát triển theo từng giai đoạn dành cho SMEs Việt Nam.

Từ khóa: phân tích kinh doanh, mức độ trưởng thành dữ liệu, logistics số, doanh nghiệp logistic nhỏ và vừa, Australia, Việt Nam

1. Introduction

Logistics is a data-dependent industry because orders, inventory, vehicle locations, customs records, warehouse events, proof of delivery and financial transactions generate continuous information flows. Accurate and connected data improve visibility, forecasting, routing and coordination, whereas fragmented records increase spreadsheet use, manual re-entry and experience-based decisions. These challenges are significant for SMEs with limited finance, specialist staff and bargaining power (Barratt & Oke, 2007; Richey et al., 2016). Technology adoption alone does not create transformation because companies must align systems with management, skills, processes and culture, while business analytics requires reliable data, managerial capability and evidence-based routines (Gupta & George, 2016; Vial, 2019; Wamba et al., 2017). Data maturity reflects progression from fragmented practices to standardized, governed and continuously improved capabilities (Paulk et al., 1993; Becker et al., 2009). Australia and Vietnam provide contrasting contexts when Australia has freight-data initiatives, service markets and regulation and Vietnam combines rapid digitalization with fragmentation, investment constraints and uneven analytical skills (Australian Government, 2019; Ministry of Industry and Trade of Vietnam, 2023, 2025). The study fills gaps in integrated maturity frameworks, ecological overreach and technology-first recommendations. It develops a seven-dimensional framework, compares maturity patterns, examines ecosystem influences and proposes a phased approach to Vietnamese logistics SMEs.

The study examines four research questions:

RQ1. Which technical, organizational and inter-organizational dimensions are required to assess data maturity in logistics SMEs?

RQ2. What recurring maturity patterns are reported for logistics SMEs in Australia and Vietnam?

RQ3. How do ecosystem conditions shape company-level opportunities and constraints?

RQ4. What staged pathway can support Vietnamese logistics SMEs in progressing towards governed analytics and ecosystem connectivity?

The study contributes an integrative conceptual framework, a transparent qualitative comparison and propositions for future company-level validation and provides an evidence hierarchy and a staged implementation pathway for Vietnamese logistics SMEs.

2. Analytical framework and Research methodology

2.1. The seven-dimensional framework

The study uses a framework with seven-dimensional to measure data maturity in logistics SMEs. This helps avoid a problem where strong technology in one area hides weaknesses in another area, including:

- Data infrastructure and architecture: Digital transformation, analytics resources and digital supply-chain technologies (Gupta & George, 2016; Vial, 2019).
- Integration and data quality: Data quality, information integration and supply-chain visibility (Barratt & Oke, 2007; Caridi et al., 2010; Ghasemaghaei, 2019).
- Management and accountability: Decision rights, ownership, access and lifecycle control (Khatri & Brown, 2010; Abraham et al., 2019).
- Analytics capability: Business analytics, strategic alignment and dynamic capabilities (Cao et al., 2015; Akter et al., 2016; Wamba et al., 2017).
- Data literacy and skills: Human resources within analytics capability and SME digitalisation (Gupta & George, 2016; Eller et al., 2020; OECD, 2021).
- Data-driven culture: Business-intelligence maturity, analytical decision-making and organisational learning (Popovič et al., 2012; Kane et al., 2015).

- External data connectivity: Information sharing, visibility and digital supply-chain integration (Barratt & Oke, 2007; Ben-Daya et al., 2019; Montecchi et al., 2021).

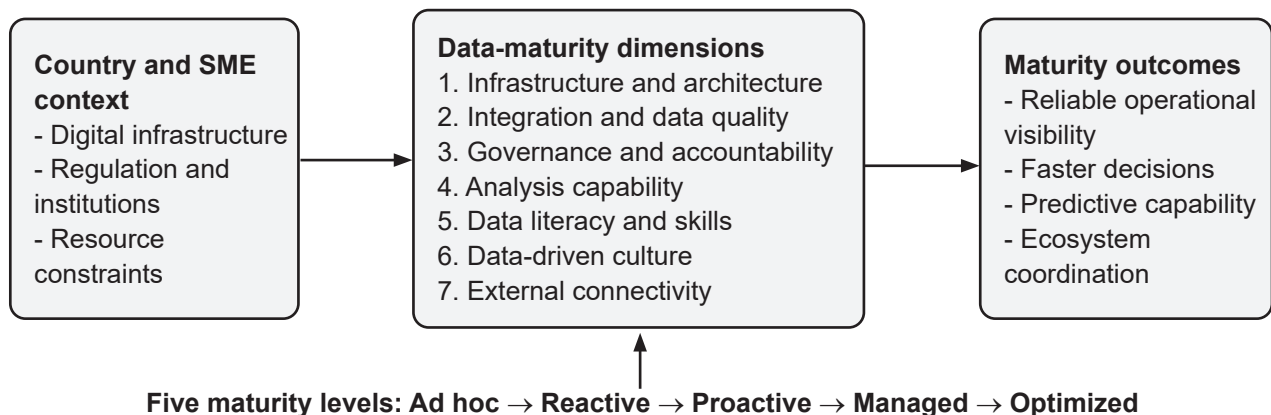
Potential overlap is controlled by focusing on the primary purpose of each practice. For example, an API between an internal warehouse and accounting system is coded under integration; an API used to exchange shipment events with a customer is coded under external connectivity.

2.2. Five indicative maturity levels

The study also uses five indicative maturity levels - ad hoc, reactive, proactive, managed and optimized - are used as a guide for interpretation rather than a formally tested measurement tool. A company does not need to display every advanced practice simultaneously, and progression is not assumed to be linear. The bands represent qualitative judgements about recurring practices in the available evidence; they do not estimate the proportion of companies at each level.

Figure 1 summarizes the relationship between country context, the seven dimensions and the operational implications associated with stronger maturity.

Figure 1. Analytical framework linking country context, data-maturity dimensions and operational implications



2.3. Research methodology

The study adopts a structured qualitative comparative synthesis of secondary evidence as no harmonized, representative company-level survey measures the seven dimensions of data maturity among logistics SMEs in both countries. The objective is not to estimate population parameters or establish statistical causality but to identify recurring practices, constraints and enabling conditions, compares how they appear across two institutional contexts, and develops an analytical framework and staged pathway for future validation.

The corpus was assembled iteratively from academic databases and publisher platforms available to the author, supplemented by government repositories, international organizations and sector bodies. The search combinations included data maturity, analytics maturity, business intelligence, data management, digital logistics, logistics SMEs, freight data, supply-chain visibility, Australia and Vietnam.

Each source was qualitatively assessed according to four criteria: its direct relevance to logistics SMEs, the transparency of its methodology, its relevance to the specific analytical dimension and its independence from other groups of evidence. Because the evidence base included different types of sources that could not be compared on the same basis, no numerical quality score was assigned, the appraisal was used to determine the evidential status of each source and to support the confidence rating reported for each dimension.

3. Findings and discussion

3.1. Findings

3.1.1. Data infrastructure and architecture

Evidence from both countries suggests that logistics SMEs are increasingly adopting digital and cloud-based tools for core operational functions. In Australia, adoption is further supported by large customers, national freight initiatives and professional service networks, although direct evidence on small logistics firms remains limited and separate vendor systems still create legacy and customer-specific data silos. In Vietnam, digital use is also expanding through electronic customs, GPS, delivery platforms, warehouse applications and smart-logistics programmers. However, many firms continue to build their systems gradually in response to immediate operational needs, resulting in fragmented applications and continued reliance on spreadsheets to connect key functions. Overall, the main difference between the two contexts is not the presence of digital tools, but the extent to which those tools are integrated, governed and maintained as a coherent architecture. Australia is generally more proactive, while Vietnam remains between reactive and proactive stages.

3.1.2. Integration and data quality

Both Australia and Vietnam are expanding digital integration across logistics operations, but maturity differs. Australian logistics networks increasingly connect retailers, ports, carriers and major customers through APIs and EDI, reducing manual processing, though integration remains uneven among smaller operators and subcontractors (Australian Logistics Council, 2022; Bureau of Infrastructure and Transport Research Economics, 2024). In Vietnam, logistics systems are generally more fragmented, with spreadsheets and manual entry continuing to connect core activities; leading firms use integrated platforms, but adoption among SMEs remains inconsistent (Ministry of Industry and Trade of Vietnam, 2023, 2025; Nhan, 2024). Overall, Australia is more proactive, while Vietnam is moving from reactive to early proactive integration. In both contexts, reliable analytics requires standardized definitions and effective data-quality controls.

3.1.3. Management and accountability

Data control practices differ mainly in their level of formality. In Australia, privacy, cybersecurity and contractual requirements encourage more structured controls, especially among firms serving large customers, although direct evidence on SME-level data ownership limited (Australian Cyber Security Centre, 2024). In Vietnam, many logistics SMEs still rely on informal managerial oversight, with less clearly documented definitions and quality responsibilities, though firms working with multinational customers or customs generally apply stronger controls (Ministry of Industry and Trade of Vietnam, 2023; Pham et al., 2023). Overall, Australia is more proactive, while Vietnam remains largely reactive. Effective management requires clear ownership, consistent definitions and documented procedures rather than a dedicated data office.

3.1.4. Analytics capability

Analytics use is expanding in both countries, although organizational maturity differs. Australian firms commonly use descriptive dashboards to monitor operational performance, while predictive functions are increasingly available through vendor platforms, with advanced optimization often obtained externally (Cao et al., 2015; Australian Logistics Council, 2022). Vietnamese SMEs are also adopting dashboards and tracking systems, particularly in e-commerce and urban delivery, but most applications remain descriptive, with advanced analytics concentrated among larger firms (Ministry of Industry and Trade of Vietnam, 2025). Overall, maturity depends less on algorithmic complexity than on problem definition, data quality and clear responsibility for action.

3.1.5. Data literacy and skills

Data-driven decision-making depends mainly on leadership, management routines and the reliability of available information. Australian firms generally use more formal indicators and compliance reports, although reporting may become an administrative routine rather than a tool for learning. Vietnamese SMEs often make decisions quickly because managers are closely involved in operations, but heavy reliance on personal experience can limit the critical use of evidence. In both contexts, a stronger data culture develops when teams examine causes, test improvements and adjust practices based on results.

3.1.6. Data-driven culture

Logistics SMEs in both countries face shortages in data and analytical capability, though the conditions differ. Australia has a larger technology workforce, yet smaller firms still struggle to recruit specialized analysts, often relying on managers, vendors or consultants. Vietnam's technology workforce is growing, but logistics-specific skills remain uneven, with training frequently emphasizes software use rather than data interpretation. In both countries, effective data use cannot depend only on specialists, since operational employees also create and interpret information.

3.1.7. External data connectivity

External connectivity is improving in both countries, though integration remains uneven. Australia benefits from stronger port systems, public freight-data initiatives and mature software markets, though smaller operators often still depend on customer portals, and commercial barriers limit interoperability. Vietnam has also advanced through electronic customs and port platforms, but many SMEs continue to use manual portals rather than automated connections. Overall, effective connectivity depends not only on shared standards and infrastructure but also on firms' ability to maintain reliable identifiers and management processes.

3.1.8. Comparative thematic profile

Across the seven dimensions, Australian logistics SMEs generally sit at a proactive maturity level, while Vietnamese SMEs are more often between reactive and early proactive stages. In infrastructure, Australian core records are increasingly digital and cloud-based, though small and regional operators still face vendor silos; Vietnam's functional software and public digital systems are expanding, but spreadsheets often still connect separate activities. For integration and data quality, Australia commonly uses API/EDI in enterprise-facing networks despite subcontractor fragmentation, while Vietnam still relies heavily on manual re-entry and inconsistent identifiers. In management and accountability, Australian companies show more formal access and security controls, whereas Vietnamese management remains largely informal and owner-led. Analytics capability in Australia features common descriptive dashboards with growing predictive functions, while Vietnam's predictive and prescriptive applications stay concentrated among leading firms. Data literacy is broader in Australia despite skill shortages, while Vietnam's digital workforce is growing but lacks logistics-specific analytical skills. For data-driven culture, both countries show gaps between reporting and actual learning. In external connectivity, Australia benefits from public freight initiatives, while Vietnam's extensive e-customs and port systems are often accessed manually rather than through direct integration. Overall, differences center on integration, management, and analytical skills rather than basic digital access, with Australia's ecosystem support contrasting Vietnam's challenge of converting adoption into coordinated capability.

3.2. Discussion

The nature of the maturity gap: The main difference between Australia and Vietnam lies less in access to digital tools than in how those tools are organized and used. Both countries can adopt cloud software and

dashboards, but Australian firms operate within a more supportive environment of regulation, customer requirements and documented interfaces, while Vietnamese firms face greater fragmentation and stronger investment and skills constraints. Technology creates value only when supported by clear responsibilities, integrated processes and organizational learning - the maturity gap is therefore a coordination gap rather than a simple technology gap.

Data foundations before artificial intelligence: SMEs should avoid adopting advanced AI before establishing reliable data practices, since predictive tools require consistent records and clear event definitions or they risk repeating existing errors. However, firms need not wait for full integrated before experimenting. Small, focused projects - such as standardizing delivery-status codes or testing arrival-time predictions for one customer group - can build capability when they define a baseline, apply data-quality rules, and compare results before wider implementation.

Internal capability and ecosystem embeddedness: External connectivity should be treated as a separate dimension, since SMEs operate within wider networks of customers, carriers, ports, and vendors. These connections can lower integration costs but may also create dependence on proprietary platforms. The comparison shows that public policy mainly supports maturity by improving coordination conditions, but ecosystem support cannot replace internal capability - firms still need clear ownership, reliable data and skilled users to benefit from external networks.

Alternative explanations and boundary conditions: Observed differences may also reflect factors this study cannot fully separate, including company size, subsector, and the greater availability of documented Australian infrastructure. Findings should be treated as preliminary patterns rather than evidence that national context alone drivers maturity differences.

Conceptual contribution: The study offers an integrated conceptual framework, not a validated maturity scale, distinguishing internal integration from external connectivity. It shows analytics depends on the interaction of all seven dimensions: infrastructure generates data, integration make it usable, management builds trust, skills support interpretation and culture embed evidence in decisions. Progress is thus organizational and ecosystem capability, not technological sophistication alone.

4. Managerial and policy implications

4.1. A staged pathway for Vietnamese logistics SMEs

The evidence supports a three-stage pathway for resource-constrained SMEs, functioning as sequencing principles rather than a rigid roadmap, to be adapted to each firm's context.

Stage 1 - Data Foundation builds reliable data by mapping critical data flows, standardizing key codes, defining core indicators, assigning owners, and establishing access controls and backups. Firms should progress only when records reconcile and reports are reproducible.

Stage 2 - Integration and BI connects high-volume transport, warehouse and accounting data through standard interfaces, supported by a governed data store, role-based dashboards and supervisor training to reduce manual re-entry.

Stage 3 - Predictive Ecosystem Analytics introduces predictive models (EFA, demand, routing), connecting partner interfaces and validating results against baselines. Advanced analytics are justified only when decisions remain understandable and auditable.

4.2. Implications for managers

Managers should begin initiative with a defined business problem, baseline, accountable owner. Software should be evaluated for interoperability, security and exit options, since cloud solutions may increase vendor dependence - contracts should address data access and provider transition. Management

should stay proportionate to company size: small firms need agreed definitions and named owners without a formal data office. Data literacy should extend beyond IT staff, and performance should be measured through outcomes like cycle time and service failures - not the number of dashboards or models deployed.

4.3. Implications for government and industry bodies

Government and industry bodies can reduce coordination costs through common data guidance, documented APIs and cybersecurity support. Procurement should priorities interoperability over isolated purchases, while workforce initiatives should connect analytics training to daily operations. Universities and sector bodies can support applied projects and coordinate shared event standards among industry stakeholders. Policy transfer from Australia should adapt principles rather than copy systems directly, with pilot programs focused on high-value corridors or SME clusters. Success should be measured by reduced manual work and broader SME participation, not merely by launching new platforms.

5. Conclusion

Data maturity in logistics SMEs depends on the coordinated development of infrastructure, integration, management, analytics, skills, culture and external connectivity. The available evidence suggests that Australian logistics SMEs commonly display more established practices, while Vietnamese SMEs have made rapid progress but remain more constrained by fragmented systems, uneven management and shortages of logistics-specific analytical capability. This is an indicative comparison rather than a representative national ranking, and the difference concerns the organization and use of data more than basic access to digital technology.

The study offers a seven-dimensional framework that separates company capability from ecosystem context and presents maturity as an uneven configuration. For Vietnamese SMEs, the practical sequence is to establish reliable data foundations, integrate priority processes and business intelligence, and then introduce governed predictive and ecosystem analytics. The framework provides a transparent basis for future validation, but representative surveys, longitudinal cases and multi-coder assessment are required before the maturity bands can be interpreted as population estimates or causal explanations ■

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